Novel vectors for gene transfer into human ES cells

Grant Award Details

Novel vectors for gene transfer into human ES cells

Grant Type: SEED Grant

Grant Number: RS1-00236

Investigator:

Name:	Mark Kay
Institution:	Stanford University
Type:	PI

Human Stem Cell Use: Embryonic Stem Cell

Award Value: $574,737

Status: Closed

Progress Reports

Reporting Period: Year 2

View Report

Grant Application Details

Application Title: Novel vectors for gene transfer into human ES cells

Public Abstract: Human embryonic stem cells have a great potential for medical therapeutics. However, the genes required for altering the fate of these cells to differentiate into a particular tissue or cell type is not well understood. The ability to efficiently transfer genes or silence genes in ES cells would be of great benefit for two reasons: 1) A combination of gene therapy and ES stem cells will likely broaden the therapeutic potential of these cells, and 2) the ability to alter gene expression will provide important tools for unraveling the genetic programs required for targeted differentiation into a specific tissue or cell-type. Viral gene transfer vectors are derived from viruses. The viral genes are removed and replaced with a therapeutic gene or a gene under biological study. Thus, the viral shell is used to transfer the desired gene into cells. Although there has been some success, current gene transfer vectors do not work efficiently in ES cells. To make this new gene transfer vector, we will use the adenoassociated virus (AAV). This virus is not associated with any known disease and has been used in a number of human clinical trials. Another advantage of vectors based on these viruses is that they can be used to overproduce a gene product, turn off a gene product, and even target a mutation in a specified gene. We plan to use a recent strategy developed in our laboratory to select for AAV viruses that are very efficient at infecting human ES cells. Once these viruses are identified, as a proof-of-concept, we will make gene transfer vectors and test them in new human ES cells for their ability to over-express and turn off genes that we believe are important in early human ES cell differentiation.

Statement of Benefit to California: California is leading the way in stem cell research. The ability to transfer nucleic acids into stem cells will open up an additional therapeutic window as well as allow important tools for helping define the genetic programs required for stem cell differentiation into a myriad of different cell types. The intellectual property surrounding the vectors that we have selected and characterized by the same approach for liver transduction have been protected by a patent application submitted on behalf of {REDACTED}. Like all of our reagents and discoveries, the ES cell specific gene transfer vectors developed in our laboratory will be made available to all academic researchers around the world. We will offer these vectors to corporate entities per the rules and regulations dictated by the California State Stem Cell Institute and {REDACTED}. We should note that even prior to publication, several vectors isolated and characterized for liver gene transfer by our laboratory have been sent to commercial entities for evaluation and possible use in both research and clinical trial development. We believe that our technology will have wide-spread use by stem cell researchers in California as well as the rest of the world.
